

CLAIMS

1. An alkali metal generating agent as a supply source of an alkali metal used in formation of a photocathode for emitting a photoelectron corresponding to incident light or a secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said alkali metal generating agent comprising:

an oxidizer comprising at least one vanadate with an alkali metal ion as a counter cation; and

a reducer for initiating a redox reaction with the oxidizer at a predetermined temperature to reduce the alkali metal ion.

2. An alkali metal generating agent according to claim 1, wherein the vanadate is expressed by a chemical formula RVO_3 , where R is at least one metal element selected from the group consisting of Na, K, Rb, and Cs.

3. An alkali metal generating agent according to claim 1 or 2, wherein the reducer is at least one selected from the group consisting of Si, Zr, Ti, and Al.

4. An alkali metal generating agent according to any one of claims 1 to 3, the alkali metal generating agent being of a powder form.

5. An alkali metal generating agent according to

any one of claims 1 to 3, the alkali metal generating agent being formed in a pellet form having a predetermined shape by compression molding.

5 6. An alkali metal generating device for generating an alkali metal used in formation of a photo-cathode for emitting a photoelectron corresponding to incident light or a secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said alkali
10 metal generating device comprising:

 a case;

 a supply source housed in the case and comprising an alkali metal generating agent according to any one of claims 1 to 5; and

15 a discharge port provided in the case and adapted for discharging a vapor of the alkali metal generated in the supply source, from an interior space of the case housing the supply source, toward the exterior of the case.

20 7. An alkali metal generating device according to claim 6, wherein the case is made of a metal.

 8. An alkali metal generating device according to claim 6 or 7, wherein the case comprises:

25 a hollow container of a metal having apertures at both ends and provided with the discharge port in a side face thereof; and

lid members of a metal covering the respective apertures at the both ends of the hollow container.

9. An alkali metal generating device according to claim 6 or 7, wherein the case is a hollow container of a metal having apertures at both ends thereof,

wherein the apertures at the both ends of the hollow container are hermetically closed in a state in which the hollow container secures an interior space for housing the alkali metal generating agent, and

wherein the discharge port is provided in at least one of the both ends of the hollow container hermetically closed.

10. An alkali metal generating device according to claim 6 or 7, wherein the alkali metal generating agent is formed in a pellet form having a predetermined shape,

wherein the case is comprised of a closed-end container of a metal having a recess for housing the alkali metal generating agent, and a lid member of a metal welded to the closed-end container in a state in which the lid member covers an aperture of the recess, and

wherein the discharge port of the case is formed in a non-welded portion between the closed-end container and the lid member.

11. An alkali metal generating device according

to any one of claims 6 to 10, further comprising a glass ampule housing the entire case.

12. An alkali metal generating device according to any one of claims 6 to 11, further comprising a heating device for initiating the redox reaction of the alkali metal generating agent to generate the vapor of the alkali metal.

13. An alkali metal generating device according to claim 12, wherein the heating device comprises a high-frequency supply for heating the alkali metal generating agent by high-frequency heating.

14. A photo-cathode for emitting a photoelectron corresponding to incident light, said photo-cathode comprising the alkali metal generated from an alkali metal generating agent according to any one of claims 1 to 5.

15. A photo-cathode for emitting a photoelectron corresponding to incident light, said photo-cathode comprising the alkali metal generated from an alkali metal generating device according to any one of claims 6 to 13.

16. A secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said secondary-electron emitting surface comprising the alkali metal generated from an alkali metal generating agent according to any one of

claims 1 to 5.

17. A secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said secondary-electron emitting surface comprising the alkali metal generated from an alkali metal generating device according to any one of claims 6 to 13.

18. An electron tube comprising a photo-cathode according to claim 14 or 15.

19. An electron tube according to claim 18, further comprising:

an electron multiplying part comprised of one or more dynodes each having a secondary-electron emitting surface for emitting secondary electrons in accordance with incidence of the photoelectron emitted from the photo-cathode; and

an anode for collecting the secondary electrons outputted from the electron multiplying part and extracting the collected secondary electrons as an electric current to the outside.

20. An electron tube according to claim 18, further comprising:

an anode for collecting the photoelectron emitted from the photo-cathode and extracting the collected photoelectron as an electric current to the outside.

21. An electron tube according to claim 18, said

electron tube comprising an image tube having at least a fluorescent screen for converting the photoelectron emitted from the photo-cathode, into light.

22. An electron tube according to claim 18,
5 further comprising a streak tube comprising:

an accelerating electrode for accelerating the photoelectron emitted from the photo-cathode;

a focusing electrode for focusing the photoelectron accelerated by the accelerating
10 electrode;

an anode having an aperture through which the photoelectron focused by the focusing electrode can pass;

a deflecting electrode having a pair of electrode
15 plates opposed to each other and adapted to be able to sweep the photoelectron having passed through the aperture provided in the anode, in a predetermined direction by a predetermined deflection voltage applied between the pair of electrode plates; and

20 a fluorescent screen for converting the photoelectron deflected by the deflecting electrode, into light.

23. An electron tube comprising an electron multiplying part comprised of one or more dynodes each
25 having a secondary-electron emitting surface according to claim 16 or 17.

24. An electron tube according to claim 23, further comprising:

a photo-cathode for emitting a photoelectron corresponding to incident light, toward the electron multiplying part; and

an anode for collecting secondary electrons emitted from the electron multiplying part and extracting the collected secondary electrons as an electric current to the outside.

25. A method of production of a photo-cathode comprising an alkali metal for emitting a photoelectron corresponding to incident light, said method comprising the steps of:

preparing an alkali metal generating agent according to any one of claims 1 to 5, as a source of the alkali metal;

heating the alkali metal generating agent; and

guiding the alkali metal generated by the heating of the alkali metal generating agent, to an area for formation of the photo-cathode.

26. A method of production of a photo-cathode comprising an alkali metal for emitting a photoelectron corresponding to incident light, said method comprising the steps of:

preparing an alkali metal generating device according to any one of claims 6 to 13, as a source of

the alkali metal;

heating the alkali metal generating agent housed
in the case of the alkali metal generating device; and

guiding the alkali metal generated by the heating
of the alkali metal generating agent, to an area for
formation of the photo-cathode.

27. A method of production of a secondary-
electron emitting surface for emitting secondary
electrons corresponding to an incident electron, said
method comprising the steps of:

preparing an alkali metal generating agent
according to any one of claims 1 to 5, as a source of
the alkali metal;

heating the alkali metal generating agent; and

guiding the alkali metal generated by the heating
of the alkali metal generating agent, to an area for
formation of the secondary-electron emitting surface.

28. A method of production of a secondary-
electron emitting surface for emitting secondary
electrons corresponding to an incident electron, said
method comprising the steps of:

preparing an alkali metal generating device
according to any one of claims 6 to 13, as a source of
the alkali metal;

heating the alkali metal generating agent housed
in the case of the alkali metal generating device; and

guiding the alkali metal generated by the heating of the alkali metal generating agent, to an area for formation of the secondary-electron emitting surface.

29. A method of production of an electron tube comprising at least a photo-cathode comprising an alkali metal for emitting a photoelectron corresponding to incident light, said method comprising the steps of:

preparing an alkali metal generating agent according to any one of claims 1 to 5, as a source of the alkali metal;

heating the alkali metal generating agent; and

guiding the alkali metal generated by the heating of the alkali metal generating agent, to an area for formation of the photo-cathode.

30. A method of production of an electron tube comprising at least a photo-cathode comprising an alkali metal for emitting a photoelectron corresponding to incident light, said method comprising the steps of:

preparing an alkali metal generating device according to any one of claims 6 to 13, as a source of the alkali metal;

heating the alkali metal generating agent housed in the case of the alkali metal generating device; and

guiding the alkali metal generated by the heating of the alkali metal generating agent, to an area for formation of the photo-cathode.

31. A method of production of an electron tube according to claim 29 or 30, wherein said electron tube comprises one selected from a photomultiplier tube, a photo-tube, an image tube, and a streak tube.

5 32. A method of production of an electron tube comprising an electron multiplying part comprised of one or more dynodes each having a secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said method
10 comprising the steps of:

preparing an alkali metal generating agent according to any one of claims 1 to 5, as a source of the alkali metal;

heating the alkali metal generating agent; and

15 guiding the alkali metal generated by the heating of the alkali metal generating agent, to an area for formation of the secondary-electron emitting surface.

20 33. A method of production of an electron tube comprising an electron multiplying part comprised of one or more dynodes each having a secondary-electron emitting surface for emitting secondary electrons corresponding to an incident electron, said method comprising the steps of:

25 preparing an alkali metal generating device according to any one of claims 6 to 13, as a source of the alkali metal;

heating the alkali metal generating agent housed
in the case of the alkali metal generating device; and

guiding the alkali metal generated by the heating
of the alkali metal generating agent, to an area for
5 formation of the secondary-electron emitting surface.

34. A method of production of an electron tube
according to claim 32 or 33, wherein said electron tube
comprises one selected from a photomultiplier tube, an
image tube, and a streak tube.

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